VOLUME 62 1994

MATHEMATICS OF COMPUTATION

AMERICAN MATHEMATICAL SOCIETY

EDITED BY

James H. Bramble
Susanne C. Brenner
E. W. Cheney
James W. Demmel
Walter Gautschi, *Managing Editor*
Eugene Isaacson
James N. Lyness
Harald Niederreiter
Jorge J. Nocedal
Syvert P. Nørsett
Andrew M. Odlyzko
Frank W. J. Olver
John E. Osborn
Stanley Osher
Carl Pomerance
René Schoof
L. Ridgway Scott
Daniel Shanks
Chi-Wang Shu
Frank Stenger
Hans J. Stetter
G. W. Stewart
Nico M. Temme
Vidar Thomée
Lars B. Wahlbin
Hugh C. Williams
John W. Wrench, Jr.

PROVIDENCE, RHODE ISLAND USA

ISSN 0025-5718

Mathematics of Computation

This journal publishes research articles in computational mathematics. Areas covered include numerical analysis, the application of computational methods, algorithms for advanced computer architectures, computational number theory and algebra, and related fields. Table errata and reviews of books in areas related to computational mathematics are also included.

Subscription information. *Mathematics of Computation* is published quarterly. Subscription prices for Volumes 62 and 63 (1994) are $262 list; $210 institutional member; $170 member of CBMS organizations; $157 individual AMS member. A late charge of 10% of the subscription price will be imposed upon orders received from nonmember institutions and organizations after January 1 of the subscription year. Subscribers outside the United States and India must pay a postage surcharge of $9; subscribers in India must pay a postage surcharge of $18. Expedited delivery to destinations in North America $13; elsewhere $40.

Back number information. For back issues see the *AMS Catalog of Publications.*

Subscriptions and orders should be addressed to the American Mathematical Society, P. O. Box 5904, Boston, MA 02206-5904. *All orders must be accompanied by payment.* Other correspondence should be addressed to P. O. Box 6248, Providence, RI 02940-6248.

Unpublished Mathematical Tables. The editorial office of the journal maintains a repository of Unpublished Mathematical Tables (UMT). When a table is deposited in the UMT repository a brief summary of its contents is published in the section *Reviews and Descriptions of Tables and Books.* Upon request, the chairman of the editorial committee will supply copies of any table for a nominal cost per page. All tables and correspondence concerning the UMT should be sent to Walter Gautschi, Chairman, Editorial Committee, Mathematics of Computation, Department of Computer Sciences, Purdue University, West Lafayette, IN 47907.

Copying and reprinting. Individual readers of this publication, and nonprofit libraries acting for them, are permitted to make fair use of the material, such as to copy an article for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews provided the customary acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication (including abstracts) is permitted only under license from the American Mathematical Society. Requests for such permission should be addressed to the Manager of Editorial Services, American Mathematical Society, P. O. Box 6248, Providence, RI 02940-6248. Requests can also be made by e-mail to `reprint-permission@math.ams.org`.

The appearance of the code on the first page of an article in this journal indicates the copyright owner's consent for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law, provided that the fee of $1.00 plus $.25 per page for each copy be paid directly to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.

Mathematics of Computation is published quarterly by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2213. Second-class postage is paid at Providence, Rhode Island. Postmaster: Send address changes to Mathematics of Computation, American Mathematical Society, P. O. Box 6248, Providence, RI 02940-6248.

© Copyright 1994 by the American Mathematical Society. All rights reserved.
Printed in the United States of America.
♾ The paper used in this book is acid-free and falls within the guidelines
established to ensure permanence and durability.
This publication was typeset using $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX,
the American Mathematical Society's TEX macro system.
10 9 8 7 6 5 4 3 2 1 99 98 97 96 95 94

MATHEMATICS OF COMPUTATION
CONTENTS

Vol. 62, No. 205 **January 1994**

Richard S. Falk and John E. Osborn, Remarks on mixed finite element methods for problems with rough coefficients 1

Guangyan Yin, Sinc-collocation method with orthogonalization for singular Poisson-like problems 21

Martti Hamina and Jukka Saranen, On the spline collocation method for the single-layer heat operator equation 41

A. Bendali and M. Souilah, Consistency estimates for a double-layer potential and application to the numerical analysis of the boundary-element approximation of acoustic scattering by a penetrable object 65

C. Palencia, On the stability of variable stepsize rational approximations of holomorphic semigroups 93

Jinn-Liang Liu, A finite difference method for symmetric positive differential equations 105

Brahim Khobalatte and Benoit Perthame, Maximum principle on the entropy and second-order kinetic schemes 119

Patrick J. Rabier and Werner C. Rheinboldt, On the computation of impasse points of quasi-linear differential-algebraic equations 133

Yves Tourigny and Michael Grinfeld, Deciphering singularities by discrete methods 155

Oliver Aberth, Computation of topological degree using interval arithmetic, and applications 171

Qiang Ye, A breakdown-free variation of the nonsymmetric Lanczos algorithms 179

Zhaojun Bai, Error analysis of the Lanczos algorithm for the nonsymmetric eigenvalue problem 209

Edward Neuman, A new formula for box splines on three-directional meshes 227

Ren-Cang Li, On perturbations of matrix pencils with real spectra 231

J. L. Lavoie, F. Grondin, A. K. Rathie, and K. Arora, Generalizations of Dixon's theorem on the sum of a ${}_3F_2$ 267

J. Bartolomeo and Matthew He, On Faber polynomials generated by an m-star 277

Zvi Drezner, Computation of the trivariate normal integral 289

Sven Ehrich, Error bounds for Gauss-Kronrod quadrature formulae 295

Richard Crandall and Barry Fagin, Discrete weighted transforms and large-integer arithmetic 305

A. J. W. Duijvestijn, Simple perfect squared squares and 2×1 squared rectangles of order 25 325

Don Coppersmith, Solving homogeneous linear equations over $GF(2)$ via block Wiedemann algorithm 333
Genet M. Edmondson, Jennifer Seberry, and Malcolm R. Anderson, On the existence of Turyn sequences of length less than 43 351
Greg Butler, An inductive schema for computing conjugacy classes in permutation groups 363
Miodrag Živković, A table of primitive binary polynomials 385
J. Buchmann, M. Pohst, and J. Graf v. Schmettow, On unit groups and class groups of quartic fields of signature (2, 1) 387
R. Ernvall and T. Metsänkylä, Computation of the zeros of p-adic L-functions. II 391
J. E. Cremona and E. Whitley, Periods of cusp forms and elliptic curves over imaginary quadratic fields 407
Reviews and Descriptions of Tables and Books 431
Lorentzen and Waadeland **1**, Brezinski **2**, Press, Teukolsky, Vetterling, and Flannery **3a,b**, Atkinson **4**, Griewank and Corliss, Editors **5**, Cheney, Chui, and Schumaker, Editors **6**, Ames **7**, Bank, Editor **8**, Heiliö, Editor **9**, Rathbun **10**, Rathbun and Granlund **11**, Rathbun and Granlund **12**
Microfiche Supplements
A. J. W. Duijvestijn, Simple perfect squared squares and 2×1 squared rectangles of order 25
Miodrag Živković, A table of primitive binary polynomials

Vol. 62, No. 206 **April 1994**

R. Verfürth, A posteriori error estimates for nonlinear problems. Finite element discretizations of elliptic equations 445
Vidar Thomée and Lars B. Wahlbin, Long-time numerical solution of a parabolic equation with memory 477
Thomas Y. Hou and Philippe G. Le Floch, Why nonconservative schemes converge to wrong solutions: error analysis 497
Guangshan Jiang and Chi-Wang Shu, On a cell entropy inequality for discontinuous Galerkin methods 531
T. Ha-Duong and P. Joly, On the stability analysis of boundary conditions for the wave equation by energy methods. Part I: The homogeneous case 539
Shoufu Li, B-convergence properties of multistep Runge-Kutta methods 565
Ll. G. Chambers, A quick way of obtaining an approximate solution to a Sturm-Liouville problem 577
Hermann Brunner, Iterated collocation methods for Volterra integral equations with delay arguments 581
Pierluigi Amodio and Francesca Mazzia, Backward error analysis of cyclic reduction for the solution of tridiagonal systems 601

Zbigniew I. Woźnicki, The Sigma-SOR algorithm and the optimal strategy for the utilization of the SOR iterative method 619
M. J. Baines, Algorithms for optimal discontinuous piecewise linear and constant L_2 fits to continuous functions with adjustable nodes in one and two dimensions 645
Lisa Lorentzen, Divergence of continued fractions related to hypergeometric series 671
Yuan Xu, Recurrence formulas for multivariate orthogonal polynomials . 687
Yuan Xu, A characterization of positive quadrature formulae 703
Klaus-Jürgen Förster, On a theorem of C. Posse concerning Gaussian quadrature of Chebyshev type 719
Giuseppe Mastroianni and Giovanni Monegato, Polynomial approximations of functions with endpoint singularities and product integration formulas 725
Hideaki Kaneko and Yuesheng Xu, Gauss-type quadratures for weakly singular integrals and their application to Fredholm integral equations of the second kind 739
Kurt Georg and Johannes Tausch, Some error estimates for the numerical approximation of surface Integrals 755
Giovanni Monegato, The numerical evaluation of a 2-D Cauchy principal value integral arising in boundary integral equation methods 765
Ralph W. Bailey, Polar generation of random variates with the *t*-distribution 779
Jürgen Eichenauer-Herrmann, Improved lower bounds for the discrepancy of inversive congruential pseudorandom numbers 783
Jürgen Eichenauer-Herrmann and Katja Ickstadt, Explicit inversive congruential pseudorandom numbers with power of two modulus 787
Raymond Couture and Pierre L'Ecuyer, On the lattice structure of certain linear congruential sequences related to AWC/SWB generators 799
Shu Tezuka, The *k*-dimensional distribution of combined GFSR sequences 809
Harald Niederreiter, Factoring polynomials over finite fields using differential equations and normal bases 819
Rainer Göttfert, An acceleration of the Niederreiter factorization algorithm in characteristic 2 831
W. Lempken and R. Staszewski, The structure of the projective indecomposable modules of $\hat{3}M_{22}$ in characteristic 2 841
Gerhard Hiss, The 3-modular characters of the Rudvalis sporadic simple group and its covering group 851
Gerhard Frey and Hans-Georg Rück, A remark concerning *m*-divisibility and the discrete logarithm in the divisor class group of curves 865
D. S. Dummit and David Hayes, Rank-one Drinfeld modules on elliptic curves 875
R. A. Mollin and H. C. Williams, Quadratic residue covers for certain real quadratic fields 885
Ken Yamamura, The determination of the imaginary abelian number fields with class number one 899
Petr Cikánek, A special extension of Wieferich's criterion 923
J. Browkin and J. Brzeziński, Some remarks on the *abc*-conjecture 931

Reviews and Descriptions of Tables and Books 941
Hackbusch and Trottenberg, Editors **13**, Keyes, Chan, Meurant, Scroggs, and Voigt, Editors **14**, Koyama **15**, Funaro **16**, Allgower and Georg, Editors **17**
Microfiche Supplement
D. S. Dummit and David Hayes, Rank-one Drinfeld modules on elliptic curves